

**OPTIMUS RAD-R/F release 3.5**  
**Upgrade kit release 3.3 / 3.4 >> 3.5**  
**4512 104 96491**

**FILING INSTRUCTIONS**

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Subsystem manual OPIMUS RAD-R/F



# PHILIPS

**Philips Medical Systems DMC GmbH**

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**SERVICE MANUAL  
742  
UNIT**

**OPTIMUS RAD-R/F release 3.5  
Upgrade kit release 3.3 / 3.4 >> 3.5  
4512 104 96491**

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**SERVICE MANUAL - UNIT****OPTIMUS RAD - R/F release 3.5****Upgrade kit release 3.3 / 3.4 >> 3.5**

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0.5 223 mm (Rosa Karton)

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3-1 ... 93 (b/01.0) OPTIMUS R/F

**2-0.1 ... 0.3 (c/01.0)** OPTIMUS RAD  
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**4-0.1** **(a/01.0)** OPTIMUS R/F  
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**2-0.1 ... 0.3 (c/01.0)** OPTIMUS R/F  
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5Z-2 (a/01.0) A4 OPTIMUS R/F

2Z-2.0 3x (01.0) A4 4512 983 05591  
2Z-2.1 (a/01.0) A4 4512 983 05601  
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2Z-2.9 (01.0) A4 4512 983 05681  
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P-List OPTIMUS RAD (840060)

P-List OPTIMUS RF (840061)

## Upgrade kit OPTIMUS RAD - R/F release 3.5

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## 1. Introduction

This modification kits provides the latest software for OPTIMUS rel. 3.x generators.

Together with the user desk and the high-speed rotor control software it delivers all current improvements and bug fixes for the OPTIMUS generators.

## 2. Compatibility

For all OPTIMUS RAD / RF release 3.x generators observe all "4. Prerequisites " carefully.

## 3. Explanation of changes for the customer / application

The maximum value for dose correction has been limited.

At Bucky auxiliaries the sum of all dose corrections is

max. +/- 2 steps of 25% (+/- 4 formerly)

or

+/- 4 steps of 12% (+/- 8 formerly)

or

+/- 8 steps of 6% (+/- 16 formerly).

This is valid for all auxiliary settings, individual APR settings and patient size corrections.

At DSI auxiliaries no dose corrections are possible anymore except for the patient size corrections (same max. limits as for Bucky). One should be aware of the fact that the image quality might change with additional dose corrections.

This requires that the APR is downloaded to have the data available for maintenance in case there are higher correction values programmed than possible after the upgrade.

Higher correction values are automatically limited after the flash load process.

- Use the program APRMAN.EXE (version 2.1 13.3.1999) to download all APR from the generator and save them as file.

## 4. Prerequisites

The following FCOs must have been carried out:

- 00 135 004 Error combination 00XI + 00M3
- 00 135 006 Upgrade to release 3.3
- 00 135 009 Electric shock during service activities (50kW only)
- 00 135 014 Firmware update kV-control (65/80kW only) to release 3.2 RAD and release 1.2 R/F
- 00 135 016 Error 00TH during tube adaptation

## 5. Contents of upgrade

- Service disk A with self-extracting file 4512 116 02206  
OMA 02206.EXE 02.10.2001
- Service disk B with self-extracting file 4512 116 02306  
OMB 02306.EXE 02.10.2001
- PROM C300 D2 control desk 4512 113 20525
- PROM Y100 rotor control high-speed 4512 113 22323  
(only for rotor control units 4512 104 7142. and 4512 104 7146., check 12NC at unit base plate).
- This document 4512 984 25551
- Service manual chapters 1...7 + parts lists to be replaced or added
- User manuals OPTIMUS 50/65/80 release 3.5  
(English, French, German, Spanish)

## 6. Modification

### 6.1. PROM exchange

- Switch off the generator.
- Open the control desk and exchange the PROM D2 labeled **20525** on C300.

If units 4512 104 7142. or 4512 104 7146. are present:

- Exchange the rotor control PROM labeled **4512 113 22323**.
- Switch on the generator.
- Check with the new PROMs in that the system behaves as it did before:
  - control desk display and usage.
  - acceleration and braking if the RoCo PROM was exchanged.

### 6.2. Preparation for firmware loading

- Create a new directory on the PC hard-disk, e.g. OPT\_R35.

Copy files OMA02206. EXE and OMB02306. EXE into this DIR and start both, they are self-extracting.

The OM... .EXE files can be erased afterwards.

### 6.3. Establish PC-generator connection

- Establish connection with the data cable between PC and generator. Start XRGSCOPE with PC-hardkey from the new DIR.

The actual exposure counter table must be recorded. These tables get lost after flash loading of release 3.5. They are replaced by the improved counter table of release 3.5.

Optimus (XRG90) >> Accept >> Inspect >> **Tube 1 ...3 Statistic.**

- Enter the counter table(s) in the system log book.
- Keep the PC / generator data connection established and the XRGSCOPE program running at the PC, switch the generator off.

### 6.4. Preparation of the generator

#### 6.4.1. Preparation of generators without a CAN interface

- Switch ON the generator.  
The loading process can be started once relay ENK1 has been energized.

#### 6.4.2. Preparation of generators which are connected via a CAN interface

- BuckyDiagnost TH and TH2
- DigitalDiagnost
- Thoravision
- EasyDiagnost with Bucky unit
- Disconnect the following plugs:

System	Connector		
	EZX23 signal bus	EZX42 or EZX42-1 system CAN	EZX43 or EZX43-1 system CAN
BuckyDiagnost TH / TH2	X		X
DigitalDiagnost	X	X	X
Thoravision	X	X	X
EasyDiagnost with Bucky unit	X	X	X

- Switch ON the generator.

The download procedure must not be started before relay ENK1 has been energized at least 2 minutes after the generator has been switched ON.

## 6.5. CU backup

As a precautionary measure and to get a reference file the actual status of the CU NVRAM should be downloaded before loading the flash release 3.5:

Optimus (XRG90) >> Accept >> Download >> **CU Complete**. Filename: CUxxxxxx (xxxxxx = 6 digit serial number of the generator base, file size approx. 700kB, loading time about 15 minutes).

- Keep the PC <> generator data connection established.
- Switch the generator off.
- Leave the XRGSCOPE program with the <alt> and the "x" keys.

The PC should display the files of the new release 3.5 directory, look for FLASH1.BAT or FLASH2.BAT and proceed with the next item.

## 7. Loading of generator CU firmware release 3.5

- The generator must be OFF.
- When installing the firmware

```
from COM 1   enter   FLASH1.BAT
from COM 2   enter   FLASH2.BAT
"Attempting link" appears on the screen.
```

- Switch ON the generator.

Depending on the type of PC data transmission takes 15 ... 30min.  
During this process all red LEDs of the function unit are blinking.

### Caution!

**When the data transmission to the generator is completed, the scope program is still active. This is unfortunately not displayed on the screen. For several minutes, while the screen is blank, the flash PROMs are loaded into the generator. This process must under no circumstances be disturbed! At the end of this sensible procedure "Flash loaded o.k." appears on the screen. Only now the scope program can be terminated.**

- Reset the generator.

## 7.1. Tube data file upgrade

Tube data for the temperature calculation have been improved.

This requires that all tubes have to be re-programmed followed by a re-adaptation.

The generator must still be disconnected from the system CAN during tube data loading (TUBE\_R3.TDL file date 18.4.2001).

### 7.1.1. Tube data set

The loading process

- Select menu:  
PROGRAM/ TUBES/TUBE 1 ... 3/ **TUBE 1 ... 3 DATA SET.**
- Start the displayed file *TUBExxx.tdl* with <RETURN>.  
All the permitted combinations of tube type and housing type are listed in a window.



- Select the respective combination of tube type and housing type from the list and push <RETURN>.
- RESET the generator.  
Then the data which have been configured up to now are read by the processor when the system is started.

### 7.1.2. Tube adaptation

All filaments have to be adapted afterwards. If possible, monitor the kV waveform during adaptation.



**Warning!**  
**Radiation is released during the adaptation procedure!**

#### 7.1.2.1. General information

Tube adaptation is an automatic process which includes:

1. The measurement of the mA offset value that is caused by:
  - the kV measuring circuit
  - the emission current feedback circuit (VCO).
2. The measurement of the individual standby filament current (based on 100µA).
3. The emission current characteristic as f (kV, filament current).
4. The dynamic behavior (positive and negative boost adaptation) where the inertia of the filament with respect to heating up and cooling down is registered.  
For more information refer to section 3: FAULT FINDING.

#### Note

*In case of problems check the symptom / solution list at the end of this adjustment chapter. Repeat the adaptation for this particular focus.*

### 7.1.2.2. Preconditions / Programmings

- Switch OFF the generator.

Preparation of generators which are connected via a CAN interface:

- BuckyDiagnost TH and TH2
- DigitalDiagnost
- Thoravision

- Disconnect the following plugs:

System	Connector		
	EZX23 signal bus	EZX42 or EZX42-1 system CAN	EZX43 or EZX43-1 system CAN
BuckyDiagnost TH / TH2	X		X
DigitalDiagnost	X	X	X
Thoravision	X	X	X

- Switch ON the generator.

#### Note

*The adaption procedure must not be started before relay ENK1 has been energized at least 2 minutes after the generator has been switched ON.*

- The tube must be conditioned as described in chapter 8.3.1 "Tube conditioning".

- Check the upper kV limit

Select menu XRGSCOPE:

PROGRAM/ TUBES/ TUBE LIMITS/ **MAX. TUBE VOLTAGE LIMIT [kV]**.

The programmed value should match the nominal value of the tube connected or in case of older tubes the upper kV limit should be set to the max. application kV.

Once an adaptation is completed the new limit value indicates as ADAPTED TO [kV].

- Perform the following programmings temporarily for each tube connected to one of the assigned

RGDV = Free cassette

Select menu XRGSCOPE:

PROGRAM/ REGISTRATION DEVICES/ RGDV#/ **DATA SET A**

Programming	Temporarily	Original Tube
Enable handswitch .....	YES	Verify the customized entries in 2Z-2.x
Syncmaster present	NO	
Exposure switch type	Double Step	
Exposure series / Tomo .....	YES	
Mounted radiographic .....	NONE	

### 7.1.2.3. Procedure

- RESET the generator.
- It is recommended that the high tension be monitored during adaptation.  
Connect the scope:  
Channel1: kV AV HT at EZ130 X3 (1V/div), scale: 20kV/V  
Trigger external: CTRL\_X\_C/ at backpanel EZ X74, negative slope  
Time base: 2ms/div
- Select the RGDV = Free cassette for the tube to be adapted.
- Select menu XRGSCOPE:  
OPTIMUS XRG/ ADJUST/ **TUBE ADAPTATION**
- Select the tube and focus to be adapted, start with small focus!

#### Note

*To avoid any malfunction make sure that READY is displayed on the desk before transmitting data by pushing <F2>:*

*READY state disappears, ADAP is displayed on the desk, WAITING is displayed on the PC screen.  
Wait until the generator turns back to READY state.*

- Start the adaptation process by pushing the handswitch in PREP and EXP position continuously.

The generator switches about 125 exposures for each focus. The radiation sign at the desk indicates exposures but there is no beep at the end of each exposure.

The actual kV parameters are displayed during adaptation.

The generator carries out the adaptation automatically. The procedure for one focus is completed when the desk indication changes from ADAP to TEST. The WAITING message disappears from the PC screen together with a PC beep, followed by the screen: BEFORE CONTINUING THE GENERATOR MUST BE RESET.

- RESET the generator.
- Run the adaptation for each focus (small and large) and tube.

#### Note

*As there is no tube type with a physical third (middle) focus yet, the third focus can not be adapted.*

*VARIOFOCUS values are calculated by adapted small and large focus. APR programs using VARIOFOCUS can only be selected until small and large focus are both adapted.*

- Set RGDV(s) programming to original status according to table "RGDV programming" 2Z-2.x in the end of this chapter.

### 7.1.3. Final tube adjustment work

1. BuckyDiagnost TH with CAN interface, DigitalDiagnost, Thoravision:

- Switch OFF the generator.
- Reestablish signal bus connector EZX23.
- Reestablish CAN connectors EZX42-1 and EZX43-1.
- Switch ON the generator.

2. All other systems:

- Reset the generator.

### 7.1.4. Tubes

#### Note

*Generators which are connected by a CAN interface have to be prepared as described below.*

Preparation for:

- BuckyDiagnost TH and TH2
  - DigitalDiagnost
  - Thoravision
  - EasyDiagnost with Bucky unit
- Disconnect the following plugs:

System	Connector		
	EZX23 signal bus	EZX42 or EZX42-1 system CAN	EZX43 or EZX43-1 system CAN
BuckyDiagnost TH / TH2	X		X
DigitalDiagnost	X	X	X
Thoravision	X	X	X
EasyDiagnost with Bucky unit	X	X	X

- Switch ON the generator.

#### Note

*The download procedure must not be started before relay ENK1 has been energized at least 2 minutes after the generator has been switched ON.*

*Do not care if the generator is not programmed yet.*

In the Error Log Index (path: >> Optimus (XRG90) >> Faultfind >> Logging Table >> Error Log >> **Error Log Index**) there is a 00XQ entry.

It indicates "tube statistic data invalid" as the tube load table changed its format.

Release 3.5 has a detailed table now.

All tube counters of the predecessor release are empty after flash load of release 3.5.

Details and a table of the new counter table can be found in chapter 7 ACCEPTANCE section 5 "Exposure counter".

## 8. Final work and remarks on the changes

There are no changes which can be recognized at first sight.

### 8.1. Settings

No programming screen has to be adapted to the new level 5 of release 3 after the flash load, but some changes of settings have to be carried out:

Tomography auxiliary settings have to be modified for CAN controlled systems such as Bucky TH, TH2, Digital Diagnost, Bucky unit attached to an Easy Diagnost:

RGDV 2 ( 6 at Easy Diagnost) Data Set A *(see INSTALLATION  
pages 2Z-2.2 + 2Z-2.5 + 2Z-2.7)*

Exposure series / Tomo movement: **no**

RGDV 2 ( 6 at Easy Diagnost) Data Set B *(see INSTALLATION  
pages 2Z-2.2 + 2Z-2.5 + 2Z-2.7)*

Underexposure display (non automatic techniques): **Yes**

### 8.2. The names in the screen

>> Optimus (XRG90) >> Program >> Registration Devices >> RGDV x >> RGDV x Data Set A of the programmed "Mounted radiographical controller"

changed from

Bucky Controller 1      into      Bucky Ctrl. 1/Dig.Diag.

and

Thorav./Dig.Bucky      into      Thoravision.

### 8.3. APR data

If APR data have to be adapted to the different max. dose correction re-load the modified APR data file to the generator now.

## 8.4. Error log

The error log index can be erased if there are no entries which require service work:

Optimus (XRG90) >> Faultfind >> Logging Table >> Error Log >> **Error Log Clear.**

## 8.5. CMOS backup

It is advisable to download a CMOS backup to the local backup disk with the new firmware format:

Optimus (XRG90) >> Accept >> Download >> **CU Complete.**

## 8.6. System-CAN-bus connected systems

- The RGDV settings have to be set to its original configuration.
- Switch off the generator.
- Re-establish CAN connections EZX42 / 43 (or EZX42-1 / 43-1) and signalbus EZX23.
- Switch on the generator.

## 8.7. Functional test

- Carry out a system test with all techniques, all chambers and all system functions.

## 8.8. Dokumentation change

- Exchange generator manual chapters (chapters 3, 4 and 5 of RAD and R/F are identical, therefore RAD books also get the R/F chapters):

Optimus RAD	chapters	Optimus R/F
2 RAD	2 INSTALLATION	2 R/F
3 R/F	3 FAULT FINDING	3 R/F
4 R/F	4 REPLACEMENT	4 R/F
5 R/F	5 PROGRAMMINGS	5 R/F
6 RAD	6 ADJUSTMENTS	6 R/F
7 RAD	7 ACCEPTANCE	7 R/F
PARTS RAD	PARTS LIST	PARTS R/F

- File this upgrade manual on top of the content of the generator manual.